Adjustments of premises for the processing of Aloe vera in Fifa (Jordan), according to international standards

Nell'attuale scenario economico e sociale si è affermata l'esigenza di orientare i sistemi di produzione e gli stili di consumo verso nuovi modelli virtuosi di gestione in cui l'innovazione, la qualità e la sostenibilità rappresentano elementi fondanti per la creazione di strategie sapienti e lungimiranti capaci di creare un valore "sostenibile" per tutti gli attori della "rete della vita".

Tale sfida rappresenta un tema ampiamente dibattuto nell'ambito delle Scienze Merceologiche e, in particolare, durante il XXIX Congresso Nazionale di Scienze Merceologiche dove sono stati coniugati contributi teorici con esperienze pratiche in un'ottica di valorizzazione delle conoscenze.

Il congresso ha rappresentato un'occasione di confronto, di condivisione e di approfondimento di percorsi di sviluppo su tematiche fortemente focalizzate sui seguenti aspetti:

- Industria 4.0, analizzata attraverso i binomi di innovazione e imprenditorialità, innovazione, start-up e spin-off, tecnologia e innovazione gestionale, ricerca e trasferimento tecnologico;
- Qualità 4.0, intesa come qualità di sistema e di prodotto e sistemi di gestione per la qualità;
- Sostenibilità e Corporate Social Responsability, che prende in esame l'analisi del ciclo di vita, i sistemi di gestione per l'ambiente, i metodi e gli strumenti di ecologia industriale, fino al concetto di economia circolare.

Benedetta Esposito è borsista di ricerca presso il Dipartimento di Scienze Aziendali Management and Innovation Systems dell'Università degli Studi di Salerno e cultore della materia in Scienze Merceologiche. I suoi interessi di ricerca sono nell'ambito della Corporate Social Responsibility e della Circular Economy nel settore agroalimentare.

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ADJUSTMENTS OF PREMISES FOR THE PROCESSING OF ALOE VERA IN FIFA (JORDAN), ACCORDING TO INTERNATIONAL STANDARDS

di

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Abstract (in inglese)

Aloe vera L. is a vegetal matrix of great interest. The gel obtained from its leaves is useful for the production of numerous items, even in different sectors, such as phytochemistry and cosmetics, thanks to its healthy and beneficial properties.
This action-research took place within the project "Promozione della filiera agribusiness dell'Aloe vera attraverso l'implementazione di un progetto pilota a sostegno delle cooperative di piccoli produttori nell'area di Karak in Giordania" (AID 11481), implemented by Jean Paul II Foundation and funded by the Italian Agency for Development Cooperation. The main objective of the project is to promote the A. vera agribusiness chain in the Jordan Valley in Fifa, Karak region (Jordan). According to the project, new A. vera crops have been planted in selected fields in Karak region. A. vera is not in fact a native species of that region.
Within the project, the first activity of the action-research described in this paper was to define the criteria for compliance with international standards and regulations for and the processing of aloe. Moreover, the project ask for a proposal for adapting the premises and arranging the equipment in order to start the gel production, as scheduled in the second phase of the project.

Keywords: *Aloe vera* L.; Sustainability; Food supplements; International cooperation; Action-research

Introduction

This study took place within the two-years long project "Promozione della filiera agribusiness dell'Aloe vera attraverso l'implementazione di un progetto pilota a sostegno delle cooperative di piccoli produttori nell'area di Karak in Giordania" (AID 11481), implemented by Jean Paul II Foundation and funded by the Italian Agency for Development Cooperation. The main objective of the project is to promote the *Aloe vera* L. agribusiness chain in the Jordan Valley in the region of Fifa (Jordan). According to the project, new A. vera crops have been planted in selected fields in the Karak region. A. vera is not in fact a native species of that region.

Aloe vera L. is a well-known medicinal plant, native to North Africa, but now widely distributed throughout the world for its ability to adapt and thrive in different climate conditions. Besides being used as a medicinal plant worldwide (Sanchez-Manchado et al., 2017), A. vera has become one of the most important raw materials in different industrial sectors (e.g. food, cosmetic, herbal preparations), as emerging source of bioactive components. The multi-functionality of A. vera, and therefore, its possible use in different production sectors, must take into account qualitative, regulatory and market requisites. The realization of semi-finished or finished products for certain sectors must comply with the standards required for that sector. On the other hand, A. vera grown with specific pedoclimatic conditions and agricultural inputs may be suitable for some productions and not for others.

This paper presents the results of an action-research conducted by ARCO, a university action-research centre founded in 2008 at PIN S.c.r.l. (Polo Universitario "Città di Prato") – University of Florence.

Within the project, the first activity of the action-research described in this paper was to define the criteria for compliance with international standards and regulations for the processing of *Aloe vera* L.. Moreover, the project ask for a proposal for adapting the premises and arranging the equipment in order to start the production as scheduled in the second phase of the project.

1. Materials and methods

In order to achieve the above-mentioned objectives, this action-research study has adopted a methodology based on the active involvement of the project stakeholders. In particular, the activities were carried out before and during a field mission: a) Desk-based analysis of internal reports (e.g. previous field mission reports of the project partners) and existing standards. b) On field conduction of semi-structured interviews and visit of the new fields planted with *Aloe vera* L., within the project.

A. vera is a vegetal matrix of great interest. The gel obtained from its leaves is useful for the production of numerous products, even in different sectors, such as phytochemistry and cosmetics, thanks to its healthy and beneficial properties The semi-finished product represents an interesting commodity worldwide (Sanchez-Manchado D.I. et. al, 2017). A. vera leaves need a transformation process, and the adoption of internationally recognized standards for guaranteeing hygiene and safety becomes fundamental for the export to certain markets. Table 1 lists the potential uses of A. vera gel and the reference quality standards for the production of compliant products for European markets.

Table 1. Source: authors

Potential destination	**Standard/requirements needed**
Functional foods and supplements	HACCP (mandatory application) ISO 22000 (voluntary) ISO/TS 22000 (voluntary) IADSA - "Global Guide to GMP for Supplements" (mandatory)
Food additives	HACCP (mandatory)
Cosmetics	ISO 22716 (voluntary)

The definition of standardized procedures and the adoption of good manufacturing practices (GMP) support the efficiency of processes, with consequent improvement in the quality and safety of production. In the specific case of A. vera the correct adoption of qualitative procedures also contributes for preserving the bioactive components naturally present in its leaves (Ahlawat K.S. et al., 2011). Due to improper processing procedures and lack of hygienic practices, many aloe products can reduce the content of active ingredients (Coats B.C., 1994). For this reason, the leaves must be processed in order to keep the essential bioactive components originally contained in the fresh leaves at their most (Lachenmeier K. et al., 2005).

The production of food supplements follows the European legislation on food hygiene and safety, based on the adoption of HACCP. Along with the growing interest of the food industry for this kind of references, it emerged the need to define standards and guidelines that regulate development and commercialization. The above mentioned international standards become functional to the adoption of procedures for companies involved in food supplement sector, especially for the ones willing to export its production (Ramachandra C.T et al., 2008). The standard ISO 22000, is designed to ensure safety along food chains, which facilitates companies in the adoption of a

management system for food quality and food safety. To comply with mandatory requirements, the joint application of ISO 22000 and ISO / TS 22002, can allow organizations to focus on improving food safety through continuous updating and allows the timely identification and adoption of a systematic management protocol for prerequisite programs (PRP), focused on real critical issues. More, IADSA (International Alliance of Dietary / Food Supplement Associations) published a guide on Good Manufacturing Practice (GMP) for food supplement manufacturers. The standard follows the requirements of ISO 22000 and ISO / TS 22002, but with a vertical focus on the production of food supplements. ISO 22716 standard describes the GMPs for cosmetic production. The purpose of the standard is not limited to the production phase only, but includes control, conservation and shipping activities. At European level, all cosmetic must comply with the GMP required by ISO 22716 standard.

2. Results and discussion

Within the project AID 11481, we visited the laboratory where it will be start the processing phases of *Aloe vera* L.. The room, following appropriate adjustments, will host equipment and machineries. At the beginning, interventions will be functional to adapt the premises to obtain gel from A. vera leaves. In general, these are basic and transversal activities that aim at hygienic safety, commonly used in food and cosmetic sectors:

- Layout of production premises. Construction of suitable separations between premises in order to minimize cross-contamination; separation between manipulation sites and offices.
- Storage of raw materials, food products, packaging. Identification of areas for the correct storage of raw materials and subsidiary raw materials.
- Water, air and energy supplies. Correct air filtration, drinking water supply and electricity supply. State of the art electrical system.
- Waste management. Proper management of waste and disposal.
- Machinery, cleaning and maintenance. Definition of cleaning and maintenance plans for the equipment. Cleaning and sanitizing of premises, equipment and work plans.
- Pest control. Implementation of measures to monitor and implement pest control.
- Bioterrorism. Limited access to production premises.

In this first phase, the market for the products obtained will be the local one. The first production will also allow to test the machinery installed and to allow local workers to acquire skills ability to upgrade production at a higher standard. The premises of Fifa are therefore configured as a pilot laboratory based on "learning by doing".

At the time of the field mission, the room to be adapted for processing the A. vera leaves was a kitchen / dining area. This area is approximately 27 m^2. In order to adapt the premises to process A. vera, potential sources of contamination from the environment must be taken into consideration. The boundaries of the working area (laboratory) need to be clearly identified and the access must be controlled. To minimize the sources of contamination, the flows of materials, products and people and the layout of the equipment must be defined. The perimeter outside the laboratory and the neighboring areas must be kept in order. Roads, outdoor areas and parking lots must be kept clean. With reference to the structural and dimensional limits of the area, the hypothesis in image 1 (Figure 1) identifies the working spaces with different color zones:

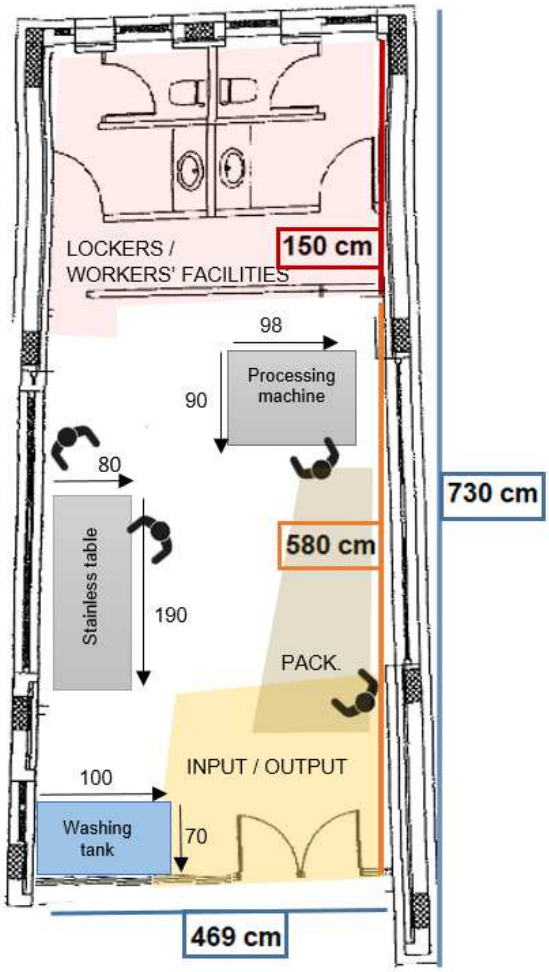
- Entrance door, products entrance/exit area (yellow)
- Transformation/processing area (white area)
- Packaging area (gray area)

In fact, materials and products follow a circular logic pattern. For the staff it would be desirable to enter the locker / service area directly and then enter the production premises.

Machineries and dedicated equipment must be connected for operation. They must also be connected with a water supply pipe and drain pipe. It is advisable to place the connections in such a way that they do not interfere with the movement of personnel and materials. More, connections must not interfere with cleaning and maintenance procedures. On the walls must be placed tiles at least up to 2 m from the ground. It is recommended that, in the processing areas, the corners of the walls are equipped with rounded skirting boards. The areas used for the storage of raw materials, packaging and products must minimize the risk of contamination. There must be a separate, safe storage area (locked or with controlled access) for chemicals and other cleaning materials. The supply of water must be sufficient to meet the needs of production processes. The laboratory must be equipped with appropriate ventilation (natural or mechanical) to avoid condensation or humidity. Natural or artificial lighting must be such as to allow employees to work hygienically. The electrical system must be built according to the Jordanian technical rules. Industrial power outlets must support an adequate voltage. It should be noted that the electrical panel of the electrical system is currently not at the entrance (suggested place). Working areas must be identified and

subjected to controlled access. Access must be physically limited by key closures and / or other alternatives.

Figure 1. Suggested layout of the working area. Source: authors



3. Conclusions and future perspectives

Following the adaptation of the premises and the installation of the machinery, as future developments, there will be the implementation of a Quality Manual in accordance with international standards.

The definition of the quality criteria (and consequently of the most suitable productions to be made with the cultivated leaves of A. vera) will be consequent to the results of analyses on samples coming from the different cultivation plots.

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